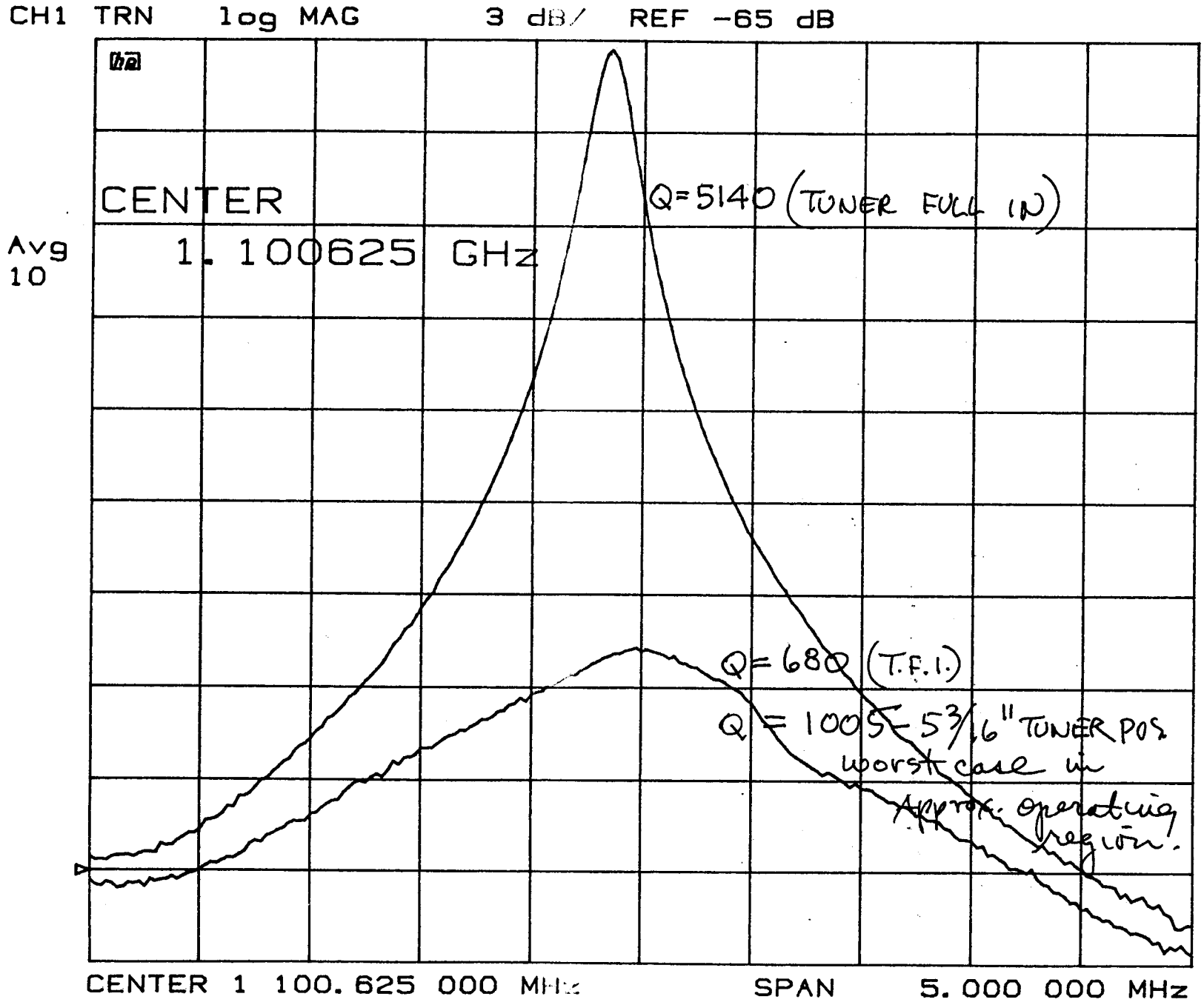

CH1 TRN log MAG 3 dB/ REF -65 dB
CENTER
1. 100625 GHz
Avg
10
Q=5140 (TUNER FULL IN)
Q=680 (T.F.I.)
Q=1005 5 3/16" TUNER POS
worst case in
Approx. operating
region.
CENTER 1 100. 625 000 MHz
SPAN 5. 000 000 MHz

3/26/98

All probes installed and terminated

Cavity temp - ambient

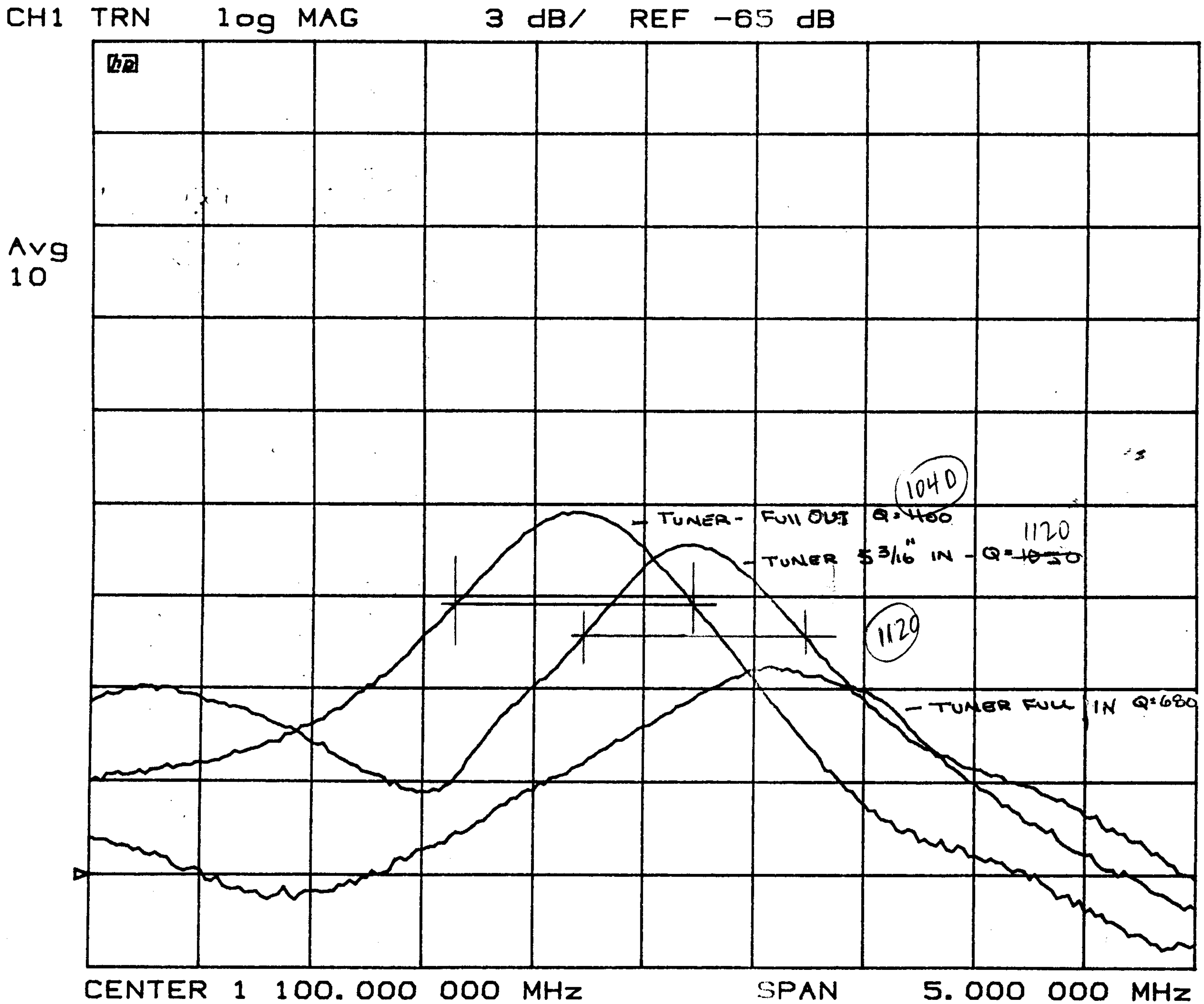
Cavity vac - N_2

Input loop installed 3:1 + connected to test sys. elmac amp.

Tuner position - full in

Sweep = transmission measurement exciting gap w/ probe showing effect of terminated S probe #

between G & F3


CH1 TRN log MAG 3 dB/ REF -65 dB
Avg 10
TUNER - FULL OUT Q=400
1040
TUNER 5 3/16" IN - Q=~~1020~~
1120
1120
TUNER FULL IN Q=680
CENTER 1 100.000 000 MHz
SPAN 5.000 000 MHz

3/28/98

All probes installed & terminated - S probe installed in port between G & F3

Cav Temp = ambient

Cav vac - N_2

Input loop installed 3:1 & connected to test system eimac amp

Sweep = 1100mhz mode w/ S probe installed with Tuner at IN STOP / OUT STOP & $5\frac{3}{16}$ (worst case)

MT: Doe Trip No. 9700516
PM: Doe Trip No. 9700512
JK: Doe Trip No. 9700519

36-38. The lower readings were closer to the EB weld regions. Eight points around the perimeter of the front cover flange were tested and the hardness varied between 36 - 38.

Frequency Sensitivity

To resolve the frequency sensitivity of the front cover - center electrode gap, the front cover was taken off and the seal removed. The cover was then replaced and a series of shims were systematically installed to vary the gap between cover and electrode. The frequency was measured at each gap distance.

	Shim(mm)	D(mm)	Freq. (MHz)	Δ f (Khz)	
Start	0	2.4	51.8050	---	D = reference gap
	3	3	51.8437	38.7	
	3.5	3.5	51.8875	43.8	
	4.0	4.0	51.9380	50.5	
	4.5	4.5	51.9865	48.5	
	5.0	5.0	52.0316	45.1	

Sensitivity = 2.2 Khz / mil or 86.6 Khz / mm.

Q measurement

To measure unloaded Q of the cavity, the drive loop was left in an open circuit condition and the network analyzer was connected to a monitor loop. The Q measured 16000.

Some rough measurements on the cavity

The total length of the cavity, diameter, and the gap spacing were measured with a tape measure and conform with the print to the accuracy of the measurement. Exact measurements will be made by ACCEL to confirm exact dimensions. Five (5) mm of extra material was left on the inside of the front cover for final frequency adjustments. This accounts for 433 Khz of error. An extra 3.5 mm is available on the front cover without jeopardizing the strength and integrity of the cover and would increase the nominal frequency to 52.56 MHz - still low by 325 Khz.

Superfish Run - Feb. 28, 1997

The original Superfish program resulted in a frequency of 52.847 MHz, which agreed with the design frequency. A new version just downloaded from Los Alamos N.L. resulted in a frequency of 52.74 MHz. Running the program again using a real fine mesh resulted in a frequency of 52.64 MHz. Extra material left on the cover would more than compensate for this error.

The large frequency error that is measured does not correlate with any known parameters and a solution has been agreed upon between BNL and ACCEL to bring the cavity back on

MT: Doe Trip No. 9700516
PM: Doe Trip No. 9700512
JK: Doe Trip No. 9700519

frequency. A forge-hardened copper ring, approximately 12 mm thick, will be EB welded to the front cover and machined to the proper dimension, enlarging the front cover-to-electrode gap.

Itinerary:

February 17, 1997	Depart New York
February 18, 1997	Arrive Dusseldorf, drive to Bergisch-Gladbach
February 19, 1997	Business with ACCEL
February 20, 1997	Business with ACCEL
February 21, 1997	Depart Dusseldorf, Arrive London
February 22, 23 1997	Weekend stayover
February 23, 1997	Depart London - Arrive New York

Persons Contacted:

Udo Klein - Managing Director (ACCEL)
Micheal Peiniger - Director (ACCEL)
Hans Peter Vogel - Project Engineer (ACCEL)
Several technicians and machinists pertinent to project.

Literature Acquired:

Various data that is enclosed in the report.

MT: Doe Trip No. 9700516
PM: Doe Trip No. 9700512
JK: Doe Trip No. 9700519

The frequency change is small compared to previously known deviations of 2 Khz / mil. This is probably due to the cover plate bowing outward as the bolts are tightened causing pivoting on the Helicoflex seal before its inner spring ring lays over. Further torquing of the bolts substantiate this. This has been previously experienced with cavity work at the NSLS.

At this point, it was decided to install a 'slug' into one of the large ports to measure the effect of the additional ports on frequency.

With the slug edge flush with the inner surface of the cavity, the frequency increased from 51.9770 MHz to 51.992 MHz (Δf = 15 Khz).

With the slug penetrating into the cavity 1 cm, the Δf was an additional 9 Khz. This is a small percentage of the total frequency error.

Remove slug and seal off port.

Evacuate cavity at this point. Δf = 108 Khz at 10^{-2} mbar. Freq. = 51.869 MHz.

Gap (mm)	Freq.(MHz)	Δ Freq.
3.6	51.869	108 Khz (vacuum)
3.4	51.850	19 Khz
3.2	51.826	24 Khz

Checked correlation between HP network analyzer and HP spectrum analyzer ⇒ 2 Khz.

Vacuum flanges leak test

At this point, the cavity was only cleaned with acetone and alcohol. No chemical cleaning had been done.

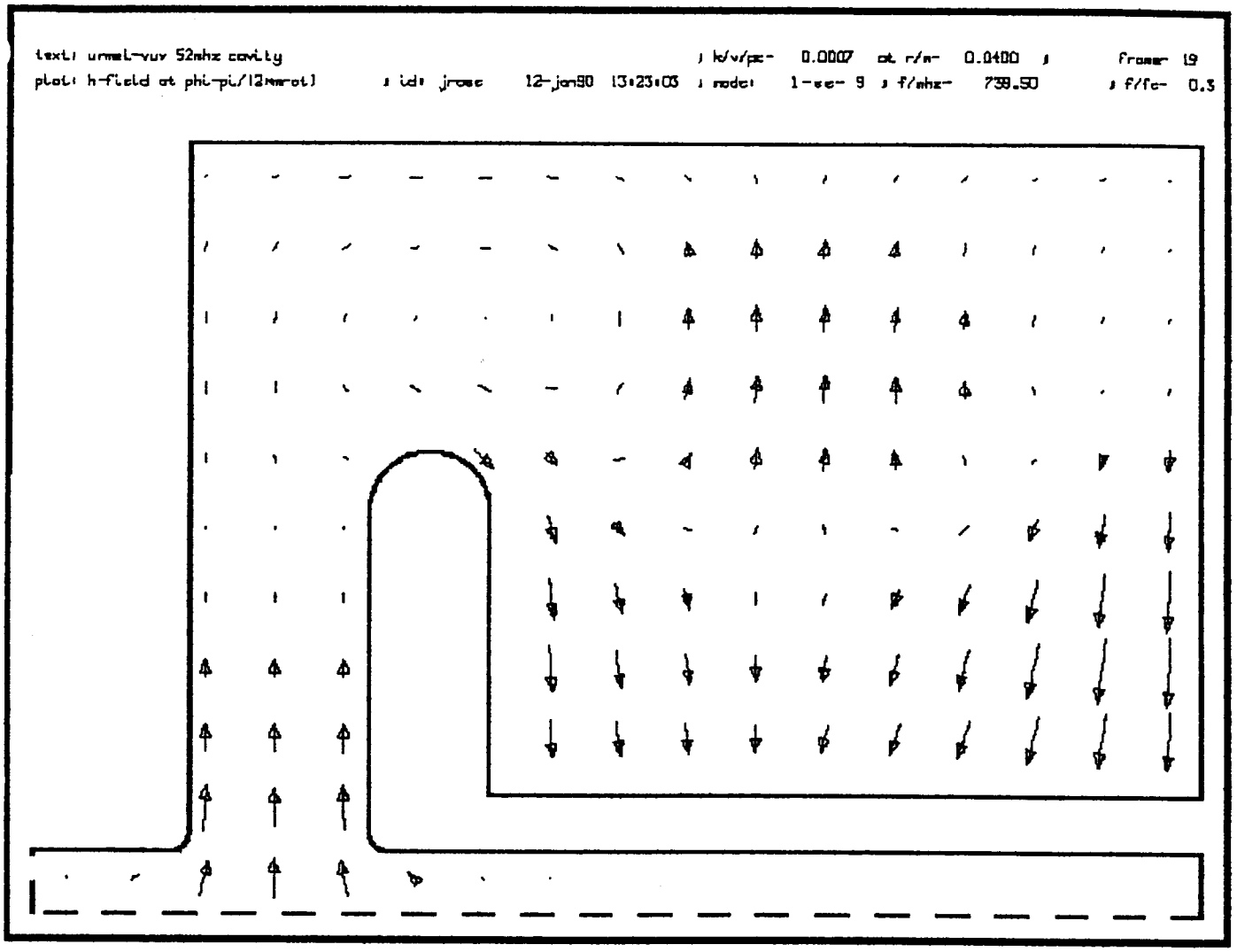
Install vacuum leak check equipment and with vacuum at 2×10^{-3}; start the leak check. The small flange clamps were tightened with a torque wrench to 20 newtons and the large flange clamps to 30 newtons.

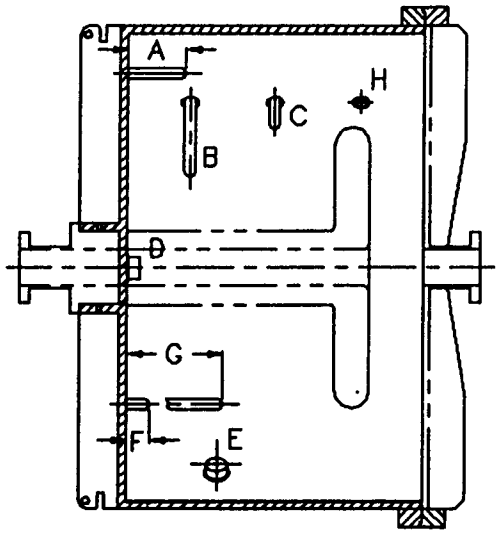
Found 2 leaks in the NSLS supplied type N connectors and sealed with gum. All Helicoflex seals and surfaces appeared tight to the helium leak check.

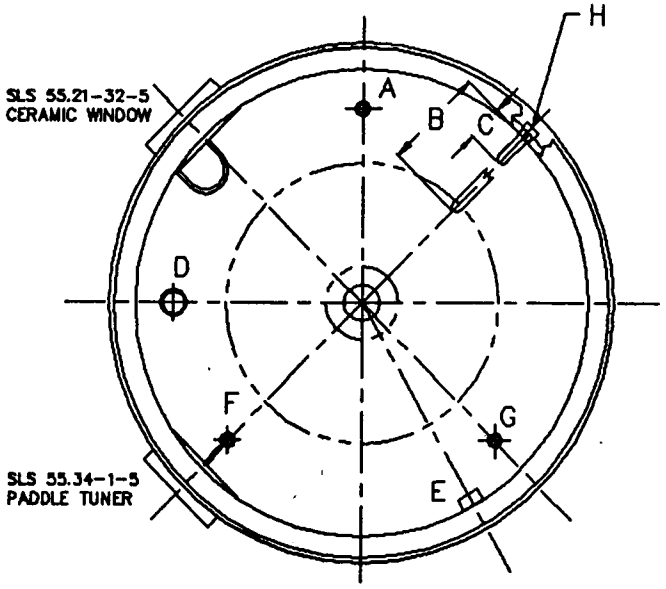
Hardness Test

Accel brought in an independent company to test the hardness of the copper. It was done with a portable Brunell hardness tester which was first calibrated on known calibrated hardness test blocks.

Two points in the vicinity of each flange was tested with the hardness varying between Brunell


text: urmel-vuv 52mhz cavity
plot: h-field at phi-pi/12mm-rot)
id: jrose 12-jan90 13:23:03
mode: 1-ee- 9
f/mhz- 739.50
f/fc- 0.3





ANTENNA ASSEMBLY
FOR X-RAY RING RF CAVITY 3

DIMS ARE IN MM [INCHES]

RF DWG NO.			ALTERNATE RF ANTENNA BODY WITH INSULATOR	
I.D. LETTER	P-LENGTH **	ANTENNA NO.	DWG NO.	LENGTH
A	127 [5.000]	SLS 55.16-1-4	SLS 55.1-37-4	180.3 [7.098]
B	219 [8.622]	SLS 55.17-1-4	SLS 55.1-37-4	272.3 [10.720]
C	76 [2.992]	SLS 55.16-1-4	SLS 55.1-37-4	129.3 [5.091]
D	MINI LOOP	SLS 55.35-1-3	********	********
E	MINI LOOP	SLS 55.35-1-3	********	********
F *	51 [2.008]	SLS 55.15-1-4	SLS 55.1-37-4 ⊕	104.3 [4.106]
G	210 [8.268]	SLS 55.16-1-4	SLS 55.1-37-4	263.3 [10.366]
H	PIN PROBE	PIN PROBE	********	********

? ½λ short

(UNCOOLED)

1

* EXTERNAL COOLING ONLY
● NOT A DIRECT REPLACEMENT FOR SLS 55.15-1-4
REQUIRES A WATER COOLED RESISTOR
** PROTRUSION LENGTH

NOTE:
1. SEE SLS 55.6-72-3 AND SLS 55.1-38-3 FOR ADDITIONAL INFORMATION

REV	DESCRIPTION	BY	DATE	CKR	APP
C	REVISED	N.G			
B	REVISED AND REDRAWN	N.G	1/1/90		

NO REQ	ACCT NO	SR NO	ORDER NO	DEPT	SLS 55.1 / JOB NUMBER
					SLS 55.1-1-6 / USED ON DWG NO.
					- / NO. PER ASSY

DEC. ±NOTED ANG. ±0.5° MAX. - MIN. -
TOLERANCE — BREAK SHARP EDGES

INTERPRET DRAWING PER ANSI Y14.5 — FINISH -√

1-4-90	-	1=8	
DATE	MATERIAL	SCALE	WEIGHT
M.GUGLIELMINO			
DRAWN BY	CHECKED BY	ENG APP	SUPVR APP

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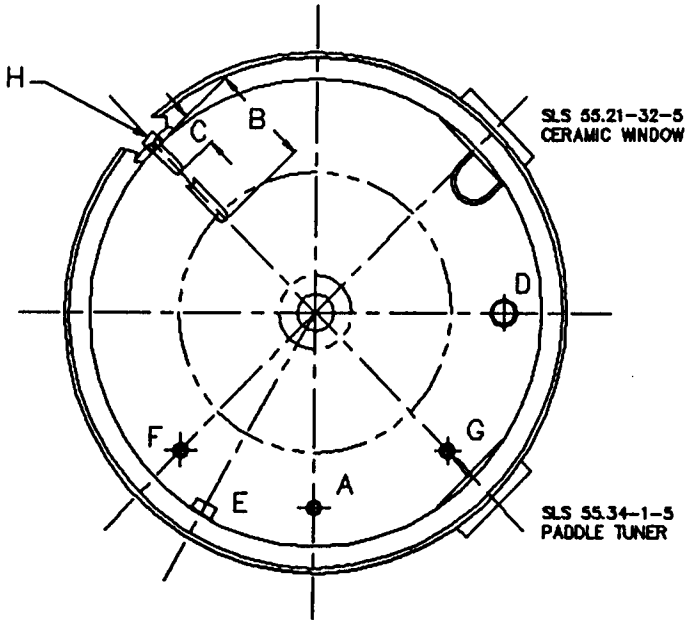
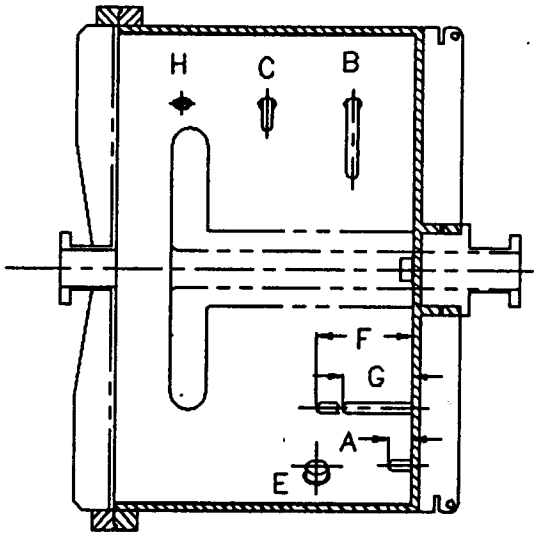
UPTON, N.Y. 11973

NSLS X-RAY RF SYSTEM
CAVITY 3 SYSTEM 1
ANTENNA SIZE AND LOCATION
SLS 55.1-35-3 — C
DRAWING NUMBER — REV.

ACAD NO. 55-01/5501035C 1

SLS 55.1-35-3





ANTENNA ASSEMBLY
FOR X-RAY RING RF CAVITY 4

DIM.S ARE IN MM [INCHES]

RF DWG NO.			ALTERNATE RF ANTENNA BODY WITH INSULATOR	
I.D. LETTER	P-LENGTH **	ANTENNA NO.	DWG NO.	LENGTH
A *	51 [2.008]	SLS 55.15-1-4	SLS 55.1-37-4 ●	104.3 [4.106]
B	222 [8.740]	SLS 55.17-1-4	SLS 55.1-37-4	275.3 [10.838]
C	78 [2.992]	SLS 55.16-1-4	SLS 55.1-37-4	129.3 [5.091]
D	MINI LOOP	SLS 55.35-1-3	********	********
E	MINI LOOP	SLS 55.35-1-3	********	******** (UNCOOLED)
F	210 [8.268]	SLS 55.16-1-4	SLS 55.1-37-4	263.3 [10.368]
G	152 [5.984]	SLS 55.16-1-4	SLS 55.1-37-4	205.3 [8.083]
H	PIN PROBE	PIN PROBE	********	********

* EXTERNAL COOLING ONLY
● NOT A DIRECT REPLACEMENT FOR SLS 55.15-1-4 REQUIRES A WATER COOLED RESISTOR
** PROTRUSION

NOTE:
1. SEE SLS 55.6-72-3 AND 55.1-39-3 FOR ADDITIONAL INFORMATION

REV	DESCRIPTION	BY	DATE	CKR	APP
C	REVISED	N.G			
B	REVISED AND REDRAWN	N.G	1/4/90		

NO REQ	ACCT NO	ILR NO	ORDER NO	DEPT	SLS 55.1	SLS 55.1-1-6	-
					JOB NUMBER	USED ON DWG. NO.	NO. PER ASS'Y

DEC. ±NOTED ANG. ±0.5° MAX. - MIN. -
TOLERANCE BREAK SHARP EDGES

INTERPRET DRAWING PER ANSI Y14.5 FINISH -

1-4-90	-	1=8	
DATE	MATERIAL	SCALE	WEIGHT
K.CUCCI/S.MINO			
DRAWN BY	CHECKED BY	ENG APP	SUPVR APP

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UPTON, N.Y. 11973

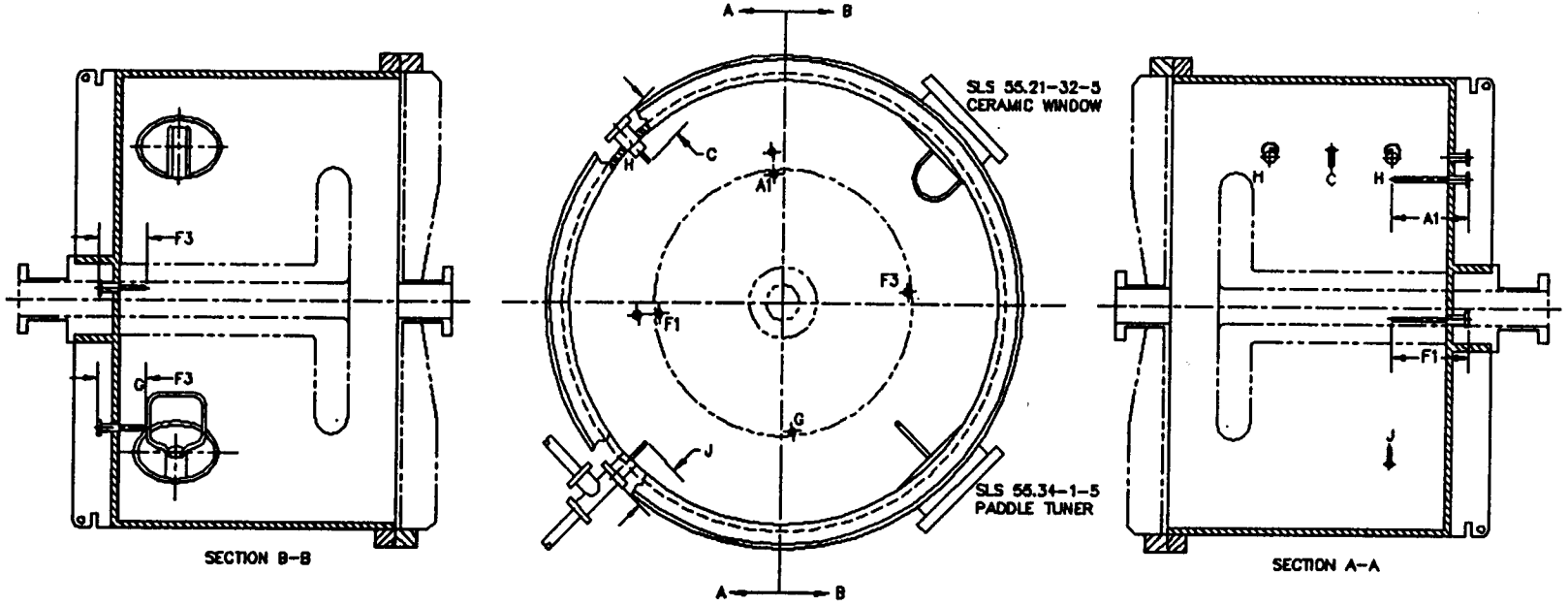
NSLS X-RAY RF SYSTEM
CAVITY 4 SYSTEM 2
ANTENNA SIZE AND LOCATION
SLS 55.1-36-3 C
DRAWING NUMBER REV.

ACAD NO. 55-01/5501036C 1

SLS 55.1-36-3

2

ITEM NO.	QTY.	DESCRIPTION	MATL/PART #	MANUFACTURER



ANTENNA ASSEMBLY FOR X-RAY RING RF
DIM.S ARE IN INCHES [MM]

RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
A1	*****	SLS 55.87-1-4
C	*****	SLS 55.87-1-4
F1	*****	SLS 55.87-1-4
F3	*****	SLS 55.87-1-4
G	*****	SLS 55.87-1-4
H	H-LOOP	SLS 55.35-1-3
J	*****	SLS 55.17-1-4

3

SLS 55.6-71-3

NOTE:
1. SEE SLS 55.6-72-3 AND SLS-55.6-73-3 FOR ADDITIONAL INFORMATION

COMPUTERIZED REPRODUCIBLE

NSLS	A-4	SLS 55.6	SLS 55.6-31-6	1
	Q.A. CAT.			NO. PER ASSY

UNLESS OTHERWISE SPECIFIED
INTERIOR TOLERANCES
DECIMAL TOLERANCES
.X ±
.XX ±
.XXX ±
ANGULAR TOLERANCE
UNSPECIFIED RADII

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UPTON, N.Y. 11973

NSLS X-RAY RF SYSTEM
CAVITY 2 SYSTEM 3
ANTENNA SIZE AND LOCATION

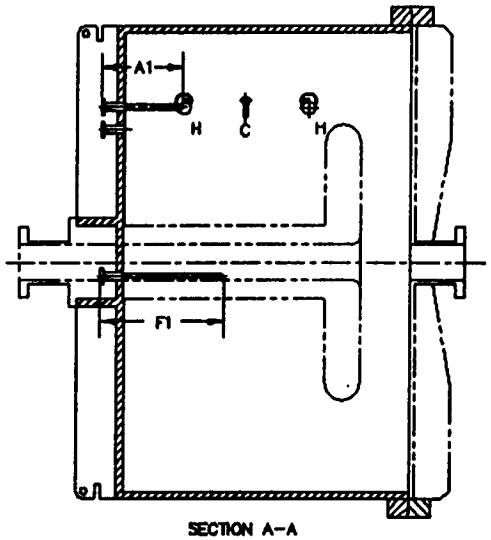
65-06/5506071A	SLS 55.6-71-3	A

SCALE 1:8 SHEET 1 OF 1

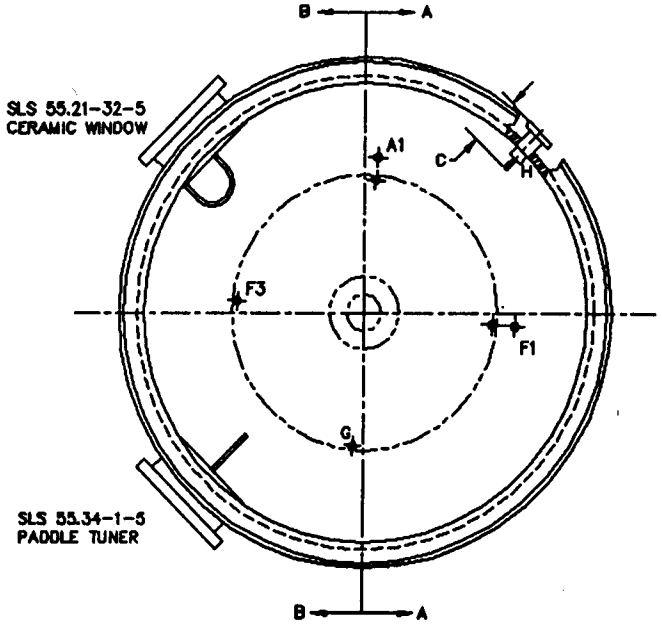
REV	DESCRIPTION	BY	DATE	CKR	APP

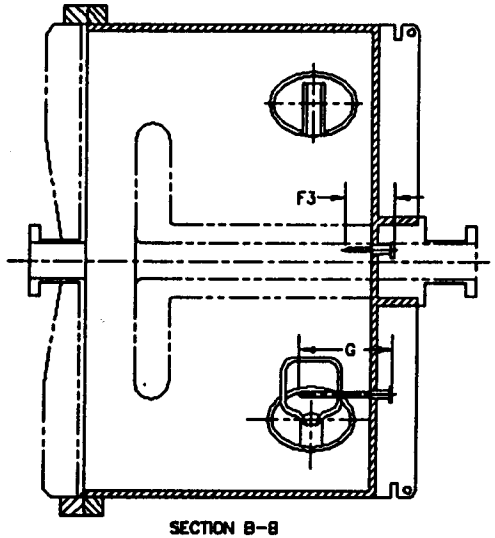
4 3 2 1

ITEM NO.	QTY.	DESCRIPTION	MATL/PART	FACTURER



SECTION A-A





SECTION B-B

ANTENNA ASSEMBLY FOR X-RAY RING RF
DIM.S ARE IN INCHES [MM]

RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
A1	7.2 [182.9]	SLS 55.87-1-4
C	4.41 [112.0]	SLS 55.87-1-4
F1	10.91 [277.1]	SLS 55.87-1-4
F3	4.41 [112.0]	SLS 55.87-1-4
G	8.43 [214.1]	SLS 55.87-1-4
H	H-LOOP	SLS 55.35-1-3

4

SLS 55.85-18-3

NOTE:
1. SEE SLS 55.6-72-3 AND SLS-55.85-19-3 FOR ADDITIONAL INFORMATION

COMPUTERIZED REPRODUCIBLE

REV	DESCRIPTION	BY	DATE	CKR	APP

NSLS

UNLESS OTHERWISE SPECIFIED
INTEGER TOLERANCES ±
DECIMAL TOLERANCES .X ± .XX ± .XXX ±
ANGULAR TOLERANCE ±
UNSPECIFIED RADII

DRAWN BY: ALGUGLIELMINO 8/07/91
CHECKED BY:
MANAGER APPROVAL:
ENGINEER APPROVAL:
QUALITY APPROVAL:

A-4	SLS-55.85	SLS-55.85-14-5	1
O.A. DWG.	JOB NUMBER	USED ON (NEXT ASSY)	NO. PER ASSY

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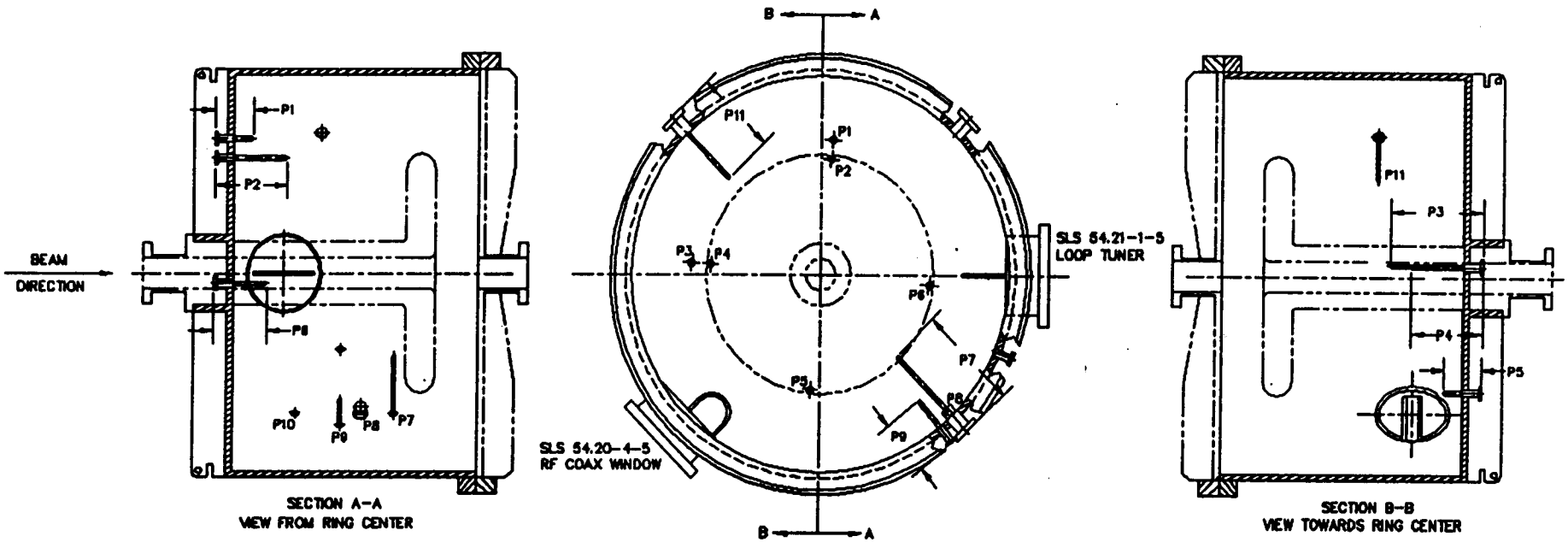
NSLS X-RAY RF SYSTEM
CAVITY 1 SYSTEM 4
ANTENNA SIZE AND LOCATION

55-85/5585018A	SLS 55.85-18-3	A
JOB NUMBER	DRAWING NUMBER	REV.

MATERIAL —— SCALE 1:8 SHEET 1 OF 1

4 3 2 1

ITEM NO.	QTY.	DESCRIPTION	MATL/PART N	MANUFACTURER



SECTION A-A
VIEW FROM RING CENTER

SECTION B-B
VIEW TOWARDS RING CENTER

ANTENNA ASSEMBLY FOR VUV RING RF
DIM.S ARE IN INCHES [MM]

RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
P1	4.0 [101.6]	SLS 55.13-1-4
P2	7.5 [190.5]	SLS 55.13-1-4
P3	9.75 [247.7]	SLS 55.13-1-4
P4	7.5 [190.5]	SLS 55.13-1-4
P5	4.0 [101.6]	SLS 55.13-1-4
P6	5.5 [139.7]	SLS 55.13-1-4
P7	10.5 [266.7]	SLS 55.13-1-4
P8	H-LOOP	SLS 55.35-1-3
P9	5.5 [139.7]	SLS 55.13-1-4
P10	E-PROBE	**********
P11	8.5 [215.9]	SLS 55.13-1-4

NOTE:
1. SEE SLS 55.6-72-3 AND SLS 54.6-70-3 FOR ADDITIONAL INFORMATION

SLS 54.2-69-3

COMPUTERIZED REPRODUCIBLE

NSLS

A-4	SLS-54.2	SLS-54.2-1-6	1

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UPTON, N.Y. 11973

NSLS VUV RF SYSTEM
VUV CAVITY
ANTENNA SIZE AND LOCATION

54-02/8402001A	SLS 54.2-69-3	A

SCALE 1:8 SHEET 1 OF 1

REV	DESCRIPTION	BY	DATE	CKR	APP

4 3 2 1